DOCUMENT RESUME

ED 283 795 SP 028 980

AUTHOR Porter, Andrew; Brophy, Jere E.
TITLE Good Teaching: Insights from the Work of the Institute for Research on Teaching. Occasional Paper No. 114.
INSTITUTION Michigan State Univ., East Lansing. Inst. for Research on Teaching.
PUB DATE Jun 87
NOTE 34p.
AVAILABLE FROM Institute for Research on Teaching, College of Education, Michigan State University, 252 Erickson Hall, East Lansing, MI 48824-1034 ($3.00).
PUB TYPE Information Analyses (070) -- Reports - Descriptive (141)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Classroom Techniques; Educational Research; Elementary Secondary Education; *Instructional Effectiveness; *Research Utilization; Student Needs; *Teacher Effectiveness; *Teaching Skills

ABSTRACT

This document draws on findings from the past decade of research on teaching, particularly on findings developed at the Institute for Research on Teaching, in order to present a model of what good teaching is, a better understanding of why it is difficult, and some hypotheses about how its frequency can be increased. Good teaching is depicted as thoughtful practice, reflecting professional knowledge featuring alignment among students' needs, curriculum goals, and instructional practices. It is noted that such ideal teaching appears to occur rarely in practice. Some reasons for this occurrence are discussed. Speculation is offered about how much improvement in the current situation can be expected as the knowledge base available to inform professional practice expands. References are included. A four-page list of references is included. (JD)

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Published by

The Institute for Research on Teaching
252 Erickson Hall
Michigan State University
East Lansing, Michigan 48824-1034

June 1987

This work is sponsored in part by the Institute for Research on Teaching, College of Eduction, Michigan State University. The Institute for Research on Teaching is funded from a variety of federal, state, and private sources including the United States Department of Education and Michigan State University. The opinions expressed in this publication do not necessarily reflect the position,policy, or endorsement of the funding agencies.

Institute for Research on Teaching

The **Institute for Research on Teaching** was founded at Michigan State University (MSU) in 1976 by the National Institute of Education. Following a nationwide competition in 1981, the NIE awarded a second five-year contract to MSU. Funding is currently received from the U.S. Department of Education, Michigan State University, and other agencies and foundations for individual research projects.

The IRT conducts major research projects aimed at improving classroom teaching, including studies of classroom management strategies, student socialization, the diagnosis and remediation of reading difficulties, and teacher education. IRT researchers are also examining the teaching of specific school subjects such as reading, writing, general mathematics, and science and are seeking to understand how factors outside the classroom affect teacher decision making.

Researchers from such diverse disciplines as educational psychology, anthropology, sociology, and philosophy cooperate in conducting IRT research. They join forces with public school teachers who work at the IRT as half-time collaborators in research, helping to design and plan studies, collect data, analyze and interpret results, and disseminate findings.

The IRT publishes research reports, occasional papers, conference proceedings, a newsletter for practitioners, and lists and catalogs of IRT publications. For more information, to receive a list or catalog, and/or to be placed on the IRT mailing list to receive the newsletter, please write to the IRT Editor, Institute for Research on Teaching, 252 Erickson Hall, Michigan State University, East Lansing, Michigan 48824-1034.

Co-Directors: Jere E. Brophy and Andrew C. Porter

Editor: Sandra Gross

Abstract

Drawing on 10 years of work at the Institute for Research on Teaching, the authors present and discuss a model depicting good teaching as thoughtful practice reflecting professional knowledge featuring alignment among students' needs, curriculum goals, and instructional practices. They also note that such ideal teaching appears to occur only rarely in actual practice, discuss some of the reasons why this is so, and speculate about how much improvement in the current situation can be expected as the knowledge base available to inform professional practice expands.

GOOD TEACHING: INSIGHTS FROM THE WORK OF THE INSTITUTE FOR RESEARCH ON TEACHING

Andrew Porter and Jere Brophy[1]

Recent years have witnessed greatly increased appreciation of the centrality of good teaching to the effectiveness of schooling and of the role of research on teaching in developing a knowledge base to inform the teaching profession. This article draws on findings from the past decade of research on teaching (and in particular on findings developed at the Institute for Research on Teaching) in order to present a model of what good teaching is, a better understanding of why it is difficult, and some hypotheses about how its frequency can be increased.

The Emerging Prominence of Research on Teaching

In the 1960s and early 1970s, scholars and policymakers concerned about educational equity and improvement did not see much need for research on teaching or for upgrading the quality of the teaching profession. Reports by Coleman et al. (1966), Jencks et al. (1972), and others were interpreted as indicating that neither schools nor teachers made important differences in student achievement. President Johnson's Great Society programs for educational improvement were based primarily upon a production function approach (e.g., outcomes follow expenditures), although this had already become suspect by 1977. When input from scientists was enlisted in school improvement efforts, the scientists tended to be subject matter specialists

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[1]Andrew Porter and Jere Brophy are co-directors of the Institute for Research on Teaching. Porter, coordinator of the Content Determinants Project, is a professor in the Department of Counseling, Educational Psychology, and Special Education at Michigan State University. Jere Brophy, coordinator of the Classroom Strategy Research Project, is a professor in the Department of Teacher Education at MSU.

but not researchers studying teaching. Their efforts featured attempts to develop curricula that would be "teacher proof." Those approaches did not meet with much success, and gradually the recognition grew that achieving genuine improvements in educational quality would require working through teachers rather than trying to work around them.

Since the mid-seventies there has been a surge of activity in research on teaching. The work has featured sophisticated methods of interviewing and observing teachers, development of rich descriptions of classroom processes, and frequently, information about linkages between classroom processes and student outcomes. Much of it was predicated on a deceptively simple thesis: Effective school learning requires good teaching, and good teaching requires professionals who exercise judgments in constructing the education of their students. In retrospect, this thesis was revolutionary, representing an ideological premise as well as a scientific claim. It led to associated transformations in thinking about the role of research on teaching in providing a data base to inform educational improvement.

In 1977, teachers were viewed either as weak links in the educational process to be skirted or as technicians to be programmed. Now, educational reform leaders state that

> the key to success lies in creating a profession equal to the task--a profession of well-educated teachers prepared to assume new powers and responsibilities to redesign schools for the future (Carnegie Forum on Education and the Economy, 1986, p. 2).

Today, educational practitioners are looking to research on teaching for professional input. They are looking less for prescriptions, however, and more for principles that will increase their effectiveness as semiautonomous professionals who negotiate and mediate among complex and sometimes

contradictory task demands as they pursue goals of excellence and equity. In the words of Michigan teacher Linda Alford,

> Research lets us see how others teach. . . . We can see the effects of their behavior, test our decisions against theirs, match our strategies against theirs, and gain insights into ourselves and our teaching (Alford, 1983, p. 2).

These views of teaching and research are very different from earlier views that cast teachers as technicians who deliver "teacher-proof" curricula. Research has shown that students who receive active instruction and work supervision from their teachers achieve more than students who spend most of their time working through curriculum materials on their own (Brophy & Good, 1986); and other research shows that much of this active instruction results from professional planning, thinking, and decision making by teachers (Clark & Peterson, 1986). Good teachers adapt instruction to the needs of the students and the situation rather than rigidly follow fixed scripts.

Conceptual Framework

Figure 1 provides a model of good teaching that identifies factors influencing teachers' instruction of particular academic content, including information that teachers might consider during preactive planning of instruction and actions that they might consider during interactive teaching. Proceeding from left to right, the model portrays good teaching as a tightly coupled rational process in which background and milieu factors influence teachers' development of professional pedagogical knowledge and routines, which influence the planning of instruction, which influences the nature of the instruction that actually occurs, which (along with student aptitude and motivation factors) influences students' immediate responses to instruction and ultimately the long-term outomes of instruction. There is also a self-correcting mechanism: Good teachers reflect on the feedback that they get on

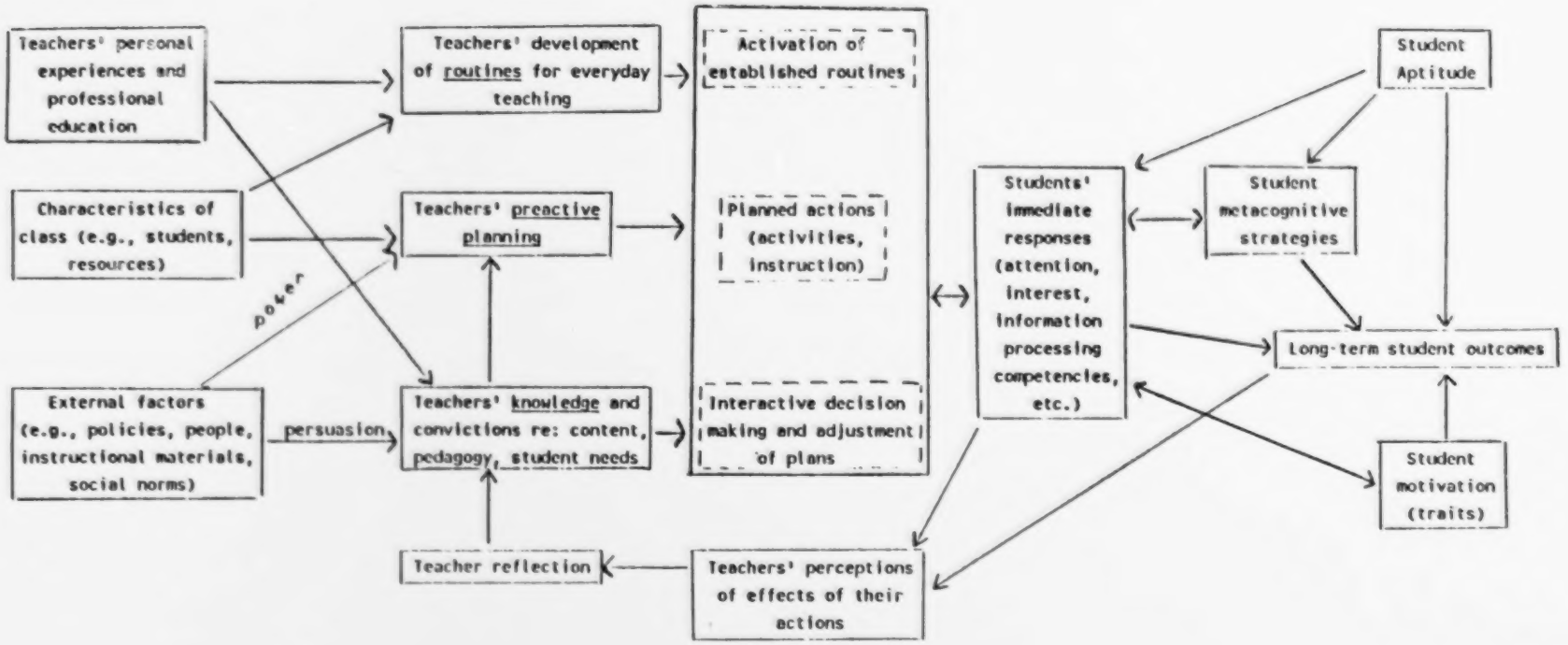
Teachers' personal experiences and professional education
Characteristics of class (e.g., students, resources)
External factors (e.g., policies, people, instructional materials, social norms)
Teachers' development of routines for everyday teaching
Teachers' preactive planning
Teachers' knowledge and convictions re: content, pedagogy, student needs
persuasion
power
Activation of established routines
Planned actions (activities, instruction)
Interactive decision making and adjustment of plans
Teacher reflection
Teachers' perceptions of effects of their actions
Students' immediate responses (attention, interest, information processing competencies, etc.)
Student Aptitude
Student metacognitive strategies
Long-term student outcomes
Student motivation (traits)

Figure 1. Model of factors influencing teachers' instruction of their students in particular content.

the effects of their instruction. This reflection enhances their professional knowledge and affects their future instructional planning.

The model illustrates that teaching is highly complex, containing many points for possible breakdown or error. The best teachers negotiate their way through this complexity by attending to each of the relevant factors. Most teachers, however, are less sophisticated and systematic in planning and carrying out instruction. The sheer complexity of the teaching task and of the milieu in which it is conducted in typical classroom settings makes it necessary for all teachers to rely on procedures, routines, implicit decision rules, and other simplification strategies that make the task more manageable. Teachers operate with "bounded rationality" (Simon, 1957) within these simplifications. Research has documented substantial differences in the degree to which individual teachers' implicit models are rational and effective for generating good instructional planning and decision making.

Several features of Figure 1 highlight ways in which recent work has moved beyond earlier conceptions of teacher thinking and its role in instructional planning and implementation:

--Both the origins and the outcomes of teacher thinking are represented; early research on teacher thinking was largely descriptive, with little attention to where it came from or what its effects on students might be.

--The model represents long-term effects on students' academic learning as mediated by students' immediate reactions to instruction. Effective teaching not only provides students with input, response opportunities, and feedback but also attracts their attention and interest and stimulates them to activate information-processing strategies, sense-making strategies, and other cognitive and metacognitive components of learning for meaningful understanding.

--The model represents subject matter as an essential context for understanding teachers' thoughts and actions. Early research on teacher thinking did not consider how teachers' thoughts and actions might vary in important ways depending on the content to be taught.

--Teachers' routines are included along with teachers' conscious planning and interactive decision making as determinants of instruction. Many teacher practices occur not because they are consciously planned but because routines developed through prior experience are activated automatically in relevant situations. Some of these routines were consciously developed originally; others were acquired as habits through modeling or conditioning and have never been consciously examined.

--Teacher knowledge is represented as encompassing (a) knowledge about the content to be taught, (b) knowledge about pedagogical strategies for teaching the content, and (c) knowledge about the students (in particular, about student background knowledge that can be capitalized upon and about student misconceptions that will need to be confronted when teaching). Good teaching requires possession and use of all three of these categories of teacher knowledge, not just knowledge of subject matter.

--External influences on teacher thinking and action are included. This recognizes that some aspects of instruction occur in response to external pressures rather than to the teacher's own ideas about what is appropriate.

--Direct influences (power) and indirect influences (persuasion) are distinguished to explain why, for example, some teachers continue to teach in a way that is consistent with a policy even after that policy has been terminated, whereas other teachers will resist compliance with a policy or will comply with it only so long as it is in effect and backed by sanctions.

--Personal experiences, especially teachers' own experiences as students, are represented as important determinants of how teachers think and what they do.

--Teachers' thoughts and actions are represented as dynamic, reflecting the fact that teachers can do and learn from experience.

Insights from Recent Research on Teaching

Since 1976, the Institute for Research on Teaching at Michigan State University has conducted research on teacher planning, classroom management, student socialization, and instruction in several subject matter areas. Despite the diversity of topics addressed, the Institute's projects have shared several common features worth noting. First, they have focused primarily on the roles of teachers and the thoughts and actions involved in carrying out teaching activities, and only secondarily on students,

curricula, or other topics. Thus, the information developed is mostly directly relevant to those who wish to understand and improve the practice and profession of teaching. Second, the research has focused on enduring problems of practice--problems that are inherent in the fact that teachers are charged with simultaneously meeting the needs of 25 or 30 students, while working within the resource limits and constraints typically found in schools. Many of these enduring problems are dilemmas that can only be managed by optimizing to the degree that circumstances will permit rather than problems that can be solved in any complete or final sense (Lampert, 1985). Furthermore, effective response to them usually requires professional judgment and decision making to construct a response suited to the situation, rather than adoption of some procedure that is used routinely.

Third, the Institute's research has focused on the planning, thinking, and decision making that leads to teachers' classroom behavior, not just on the behavior itself. Finally, the research was planned and conducted with participation by collaborating teachers (i.e., not just faculty members and graduate students). This feature helped to ensure that the research was of interest and use to practitioners, that the assumptions built into research designs and procedures were valid, and that important complexities and situational specifics were taken into account from planning the research through to interpreting the obtained results (Porter, 1986a).

Because of the Institute's leadership in research on teaching and the breadth and scope of its research program, its findings are representative of the contributions to the knowledge base that researchers on teaching have developed in the last 10 years. It is not possible to inventory the many findings produced by the Institute's individual research projects in this

brief article. However, it has been possible to extract a number of macro-level findings concerning the nature of classroom teaching and what it looks like at its best. These findings are summarized below.

Orientations to Teaching

With its focus on teacher planning and decision making, recent research on teaching has sought to discover the origins of teachers' actions as well as their consequences. These studies reveal that teachers seldom conform to the totally rational model depicted in Figure 1 (setting clear instructional objectives, planning activities against those objectives, monitoring outcomes, and making adjustments when outcomes indicate that adjustments are needed) (Clark & Peterson, 1986). Nevertheless, teachers' classroom practices have been shown to be influenced in important ways by the goals that teachers hold for schooling and the responsibilities that they are willing to accept for themselves.

One of the fundamental challenges of teaching is that the number of important goals that could be pursued exceeds the number that can be accomplished within the time and energy available. To cope with this dilemma, teachers simplify their work environment by focusing their efforts. Because most teachers have a great deal of autonomy in determining what they do once the classroom door is closed, there is great variance in the nature and appropriateness of the goals that teachers adopt, and this results in important differences in teacher practices and in what is accomplished with students.

Some teachers emphasize goals that would be widely questioned if they were known. For example, some teachers emphasize survival and convenience goals, passing time in ways that are as pleasant as possible for them and

their students. When teachers and students strike such a "bargain," featuring sacrifice of standards in pursuit of a comfortable environment, the result is a compromised curriculum (Sedlak, Wheeler, Pullin, & Cusick, 1986).

At the other extreme, there can be negative consequences when teachers do not have focused goals and attempt to accomplish too much. For example, research has shown that teachers are much more easily persuaded to add new topics to their instruction than they are to delete topics that they have been teaching (Floden, Porter, Schmidt, Freeman, & Schwille, 1981). Although such teachers' good intentions and willingness to respond to emerging developments and information needs are laudable, the net result of their decisions is a thinning out of the curriculum. Gradually, more topics are taught for briefer periods of time, to the point that many of them are merely mentioned with little hope for student mastery. This issue surfaces frequently in educational policy debates, because "mentioning without really teaching" is one of the problems identified by critics of contemporary school curricula (e.g., Armbruster & Anderson, 1984).

Although all teachers ultimately must set goal priorities, an important recent finding has been that teachers need not always give up one goal in order to obtain the time and energy to pursue another. For example, one IRT study found that teachers who stressed goals concerning both academic achievement and socialization of student attitudes and behavior were more effective in attaining both sets of goals than were teachers who placed a high priority on socialization goals but a low priority on academic achievement goals (Prawat, 1985). A second study of elementary teachers found that those who integrated language arts instruction with instruction in other subject matter areas were successful in teaching both the language arts

skills and the other subject matter content, although few teachers taught in such integrated fashion (Schmidt et al., 1985). Research in ninth-grade general mathematics classes found that interventions designed to increase the emphasis placed on promoting students' conceptual understanding of mathematics relative to the emphasis put on drilling them in computational skills resulted in improvements not only in conceptual understanding but also in computational skills (Madsen-Nason & Lanier, 1986). These studies also suggest that some forms of instruction are more efficient than others and, in particular, that balanced and integrated instruction is more effective than instruction that tries to develop knowledge or skills in isolation from one another or that emphasizes certain objectives but slights others that are just as important.

In summary, differences among teachers in the goals they hold for their instruction help explain the differences in the teachers' effectiveness. However, there is no one-to-one relationship between teachers' goals and student outcomes. Teachers' effectiveness in attaining their goals is also determined by their knowledge of subject matter, pedagogy, and students, their classroom management and instruction skills, and other factors.

Teachers who accept responsibility for student outcomes are more effective than teachers who see their students as solely responsible for what they learn and how they behave. Just as earlier research showed that it is important for teachers to believe that students are capable of learning from instruction (Brophy & Evertson, 1976), recent research has shown that it is useful for teachers to believe that, when the teaching/learning process breaks down, both the teacher and the student must assess the situation and make corrective adjustments. For example, in a study of teachers' strategies

for coping with students who present sustained problems in personal adjustment or behavior, teachers who were identified as the most effective in coping with such problems viewed the problems as something to be corrected rather than merely endured. Furthermore, although they might seek help from school administrators or mental health professionals, such teachers would build personal relationships and work with their problem students, relying on instruction, socialization, cognitive strategy training, and other long-term solution strategies. In contrast, less effective teachers would try to turn over responsibility for dealing with the problem to someone else (such as the principal or a school social worker or counselor) or would confine their personal response to attempts to control student behavior through demands backed by threats of punishment (Brophy & Rohrkemper, 1981). As another example, research in secondary science classes showed that low-aptitude students achieve much more if their teachers accept responsibility for seeing that all students learn science than they do if their teachers attribute degree of science mastery primarily to ability and motivation factors residing solely within the students themselves (Lee & Gallagher, 1986).

Given the variety and range of individual differences with which teachers are asked to cope, it is not surprising to find that teachers are selective in the range of responsibilities that they are willing to accept for themselves. Nor is this necessarily a negative finding, because teachers may be willing to take on increasing responsibilities if they are also given effective strategies for discharging those responsibilities.

Characteristics of Effective Instruction

Process-outcome research on teaching has produced a great deal of information about relationships between particular classroom management or

instructional behaviors and gains in student achievement (Brophy & Good, 1986). Recent research on teacher thinking and decision making has complemented that work (Clark & Peterson, 1986). As the findings from these and other forms of research on teaching have become better integrated and more fully incorporated, it has become possible to extrapolate general principles of effective instruction that help to make sense of and coordinate the findings concerning specific behaviors and to "package" them in ways that make them more accessible to teachers. Attention has shifted from identifying individual teaching skills as correlates of achievement gain to development of broader and better integrated theories to explain teacher effects on student outcomes. Increasingly, these theories refer to coherent teaching strategies rather than isolated teaching skills (Doyle, 1985) and refer to the learning of particular content with meaningful understanding rather than merely to scores on standardized achievement tests when describing student outcomes (Anderson & Smith, 1987). Some of the general principles emerging from such research are described below.

Teachers promote learning by communicating to their students what is expected and why. Just as teachers do, students behave in ways that are generally consistent with the goals that they set and the responsibilities that they accept for themselves. Unfortunately, many students do not view school as a place for learning important academic knowledge and skills. Instead, they see it as a place that they are required to attend in order to acquire a certificate.

Some teachers are especially effective at helping students to understand what is to be learned and why the learning might be useful to them. These teachers begin their lessons with explicit statements about what is to be

learned and how it relates to what has been learned earlier or will be learned in the future. They motivate their students to learn by providing explanations that go beyond the immediate school context. Throughout the lesson, they monitor student task orientation to ensure that all of the students understand the reasons behind assignments as well as how to complete the assignments. Teachers' making sure that students understand what is expected and why appears to be equally useful in fostering personal and social responsibility in students (Anderson & Prawat, 1983; Anderson, Prawat, & Anderson, 1985) as it is in promoting academic achievement (Anderson, Brubaker, Alleman-Brooks, & Duffy, 1985; Duffy et al., 1986).

Teachers promote learning by providing their students with strategies for monitoring and improving their own learning efforts and with structured opportunities for independent learning activities. Making sure that students understand what is to be learned and why can be viewed as one step toward preparing students to share responsibility with the teacher for their own learning. An important complementary step is to provide students with skills and procedures that give them the capacity to learn independently. Teachers can accomplish this by explicitly modeling and instructing their students in information-processing, sense-making, comprehension monitoring and correction, problem solving, and other metacognitive strategies for purposeful learning (Duffy et al., 1986; Palincsar & Brown, 1984; Raphael & Kirschner, 1985).

Helping students to acquire metacognitive strategies is not sufficient by itself to ensure that they master those strategies. In addition, teachers must provide the students with opportunities to practice the strategies by working individually and in groups on independent learning assignments.

There is a tension, however, between giving students too much close supervision of their work versus too much latitude over what to do and how to do it. Insufficient latitude for independent learning will limit what students can accomplish whereas insufficient structuring may lead to confusion or even chaos instead of a worthwhile learning experience (Navarro, Berkey, & Minnick, 1986).

Effective teachers not only know the subject matter they intend their students to learn, but also know the misconceptions that their students bring to the classroom that will interfere with their learning of that subject matter. It cannot be taken for granted that teachers understand the content they are expected to teach. Even at the elementary school level, some teachers have a much better grasp of the concepts, skills, and applications their students are supposed to learn than other teachers do. Greater differences among teachers exist in their ability to enrich instruction by drawing on subject matter knowledge that goes beyond the immediate goals for student learning. Research has begun to document ways in which command of subject matter influences teachers' expectations for what students can and should learn as well as the effectiveness of the teachers' pedagogical strategies (Anderson & Smith, 1987; Flower & Hayes, 1980; Hollon & Anderson, 1986; Leinhardt & Smith, 1985; Shulman, 1986).

In addition to command of the subject matter they teach and of pedagogical strategies for teaching it, teachers need to know about how to adapt their instruction to the students' preexisting knowledge and beliefs about the subject matter. This not only means "beginning where the students are" and building bridges linking the content to be learned to the students' existing knowledge, but also drawing out and confronting any misconceptions

that the students may have about the topic that otherwise may persist and distort their learning. For example, most elementary students believe that plants get their food from the soil--an idea that squares with commonsense language and understanding but conflicts directly with the scientific concept of photosynthesis. Instruction proceeds much more effectively if teachers confront this misconception directly, summarizing and contrasting the key differences between the commonsense notion of food and the scientific concept of food. Unless teachers confront student misconceptions directly and contrast them sharply with the more precise and accurate scientific conceptions to be taught, the students may not recognize the differences and may emerge from the unit of instruction with their entering misconceptions still intact (Eaton, Anderson, & Smith, 1984).

This is but one example from a much larger literature on what is becoming known as "conceptual change teaching" (Anderson & Smith, 1987). Conceptual change teaching strategies are based on the premise that teaching does not involve infusing knowledge into a vacuum but instead involves inducing change in an existing body of knowledge and beliefs. Traditional instructional strategies have emphasized the facilitative role of relevant preexisting knowledge and beliefs in providing anchoring points and starting places for extending students' knowledge. Conceptual change teaching acknowledges these advantages to the extent that relevant preexisting student beliefs are accurate, but it calls attention to the fact that sometimes such beliefs are inaccurate and constitute misconceptions that need to be confronted and changed rather than readiness factors to be reinforced and built upon. Conceptual change teaching strategies are especially applicable

to instruction in science, where student misconceptions abound, although they are sometimes needed in teaching any subject matter.

Despite widespread recent interest in improving schooling and reforming teacher education, scant attention has been paid to the need to develop in teachers a working knowledge of subject matter, pedagogy, and students that is integrated and accessible. Teacher education courses provide some general knowledge about pedagogy and child development but seldom provide integrated and specific information about teaching particular content to particular types of students. Arts, sciences, and humanities courses teach advanced knowledge in the various disciplines but do not address issues of curriculum and instruction in the subject matter in elementary and secondary classrooms. While much remains to be learned about effective instruction of particular academic content, more is already known than is being taught systematically to teachers. Thus, an important goal of teacher education reform efforts should be to remedy this problem, not only by infusing relevant content into teacher education programs but also by introducing structural changes in such programs to ensure that knowledge about subject matter, pedagogy, and students is developed in an integrated and application-oriented fashion.

Published instructional materials usually contribute to the quality of instruction. Partly as an unfortunate backlash to attempts to create "teacher-proof" curricula, many teacher educators view published curriculum materials as sterile. They socialize new teachers to believe that good teachers are not textbook followers. Instead, they urge prospective teachers to believe that they should break new ground in their instruction, either developing their own instructional materials or expecting students to learn without the support of published curricula. The idealism underlying such

teacher education may be praiseworthy, but the advice given is impractical and counterproductive. Teachers are not trained to develop their own materials, and the constraints of the typical teaching assignment do not provide the time needed to develop good instructional materials in any case (Ball & Feiman-Nemser, 1986).

Clearly, published instructional materials have their faults. The literary and pedagogical value of passages in reading texts on which students spend large quantities of time have been questioned (Anderson, Hiebert, Scott, & Wilkinson, 1985). So has the tendency of mathematics texts to cover large numbers of topics briefly (Freeman et al., 1983). However, the implied assumption that teachers can do better working on their own with scarce time and meager financial resources is even more questionable. If teachers carefully select instructional materials to fit the curriculum goals and the characteristics of their students and then make extensive use of these materials, they will be able to devote most of their time and energy to practices that enrich the content through reinterpretation and expansion and that clarify the content through presentation, recitation, discussion, and evaluation activities.

Subject Matter Contrasts

Recently, research on teaching has moved from general issues of classroom organization and management, time on task, and general styles of teaching toward more specific issues concerning effective teaching of particular academic content (how to teach students to read strategically and monitor their efforts through metacognitive awareness when reading for meaning and comprehension, how to decide what mathematics knowledge and skills to teach, how to confront and correct student misconceptions when

teaching science, and how to increase the amount and improve the quality of writing instruction in elementary schools). To date, there has been practically no research designed to apply a common conceptual and measurement framework in order to identify similarities and differences in instruction in different subject matter areas, although extrapolation from the findings of studies done within single subject matter areas does suggest some commonalities as well as some ways in which teaching is unique to particular subject areas. We have been discussing the commonalities; we now turn to the differences.

Studies of elementary school teachers indicate that they spend much more time (from 30 to 45% of their total instruction time) teaching reading than any other subject (Schmidt & Buchmann, 1983). Mathematics is a distant second, but there is still a regularly scheduled period for mathematics each day, typically ranging from 30 minutes to an hour (e.g., Schwille et al., 1986). In contrast, science is rarely taught every day in elementary school classrooms (Anderson & Smith, 1987), and writing is generally not taught at a regularly scheduled time (Florio et al., 1984; Florio-Ruane & Dunn, 1987).

There are also differences in use of textbooks and curriculum materials. In reading, instructional materials tend to specify both the content and the methods to be used for teaching students to read, and teachers tend to follow these guidelines closely (Duffy, Roehler, & Putnam, 1987; Shannon, 1987). In mathematics, teachers tend to view texts as resources to be added to or (more often) deleted from as seems appropriate. Math texts are typically silent on how instruction is to proceed, serving primarily as sources of content (Freeman et al., 1983; Schwille et al., 1983). In science, teachers tend to follow the text closely, although the teacher's edition usually does not have

much to say about how instruction should proceed (e.g., Roth, Anderson, & Smith, in press). Published materials for the teaching of writing are largely unavailable as yet (Florio-Ruane, 1983; Florio-Ruane & Dunn, 1987).

There also appear to be important differences in the level of subject matter knowledge and related pedagogical knowledge that teachers have in different content areas, at least at the elementary level. Elementary teachers tend to be most knowledgeable about reading, variable in their knowledge about and interest in mathematics and writing (e.g., Clark & Florio, 1983), and typically weak in knowledge about science (Anderson & Smith, 1987). Secondary teachers tend to have strong subject matter knowledge if they are teaching the subject they majored in but may have very spotty knowledge otherwise.

In summary, research on teaching has begun to reveal important differences in the ways that different subject matter areas are taught, especially in elementary schools. These differences appear to result from subject matter area differences in the preservice course requirements imposed on teachers, inservice education opportunities available, pressures from curriculum guides and testing programs, and degree of support and structuring provided in the published curriculum materials.

Good Teaching as Thoughtful Practice

Research on teacher thinking and decision making has added important information to our understanding of the principles and practices that collectively constitute effective instruction. Drawing on preceding sections and filling in gaps from other sources, it is possible to develop an image of the good teacher as a thoughtful practitioner who operates with considerable

autonomy yet purposefully works toward a set of goals that are both differentiated and integrated.

Effective teachers are clear about what they intend to accomplish through their instruction, and they keep these goals in mind both in designing the instruction and in communicating its purposes to the students. They make certain that their students understand and are satisfied by the reasons given for why they should learn what they are asked to learn.

Effective instruction provides students with metacognitive strategies to use in regulating and enhancing their learning. It also provides them with structured opportunities to exercise and practice independent learning strategies.

Effective teachers create learning situations in which their students are expected to organize information in new ways and formulate problems for themselves, not just learn facts and solve problems that have been given to them. Such learning situations include creative writing opportunities in language arts; problem-formulation activities in mathematics; and independent projects in science, social studies, and literature. Such learning situations are intrinsically more demanding for both teachers and students than expository instruction followed by drill-and-practice exercises, but they must be included along with these more familiar learning situations if instruction is to address higher level cognitive objectives in addition to lower level ones.

Effective teachers continuously monitor their students' understanding of presentations and responses to assignments. They routinely provide timely and detailed feedback, but not necessarily in the same ways for all students.

Effective teachers frequently integrate their instruction across disciplinary boundaries so that, for example, students practice reading skills on texts that are worthwhile in their own right (e.g., interesting and well-written literature intended for children and youth, nonfiction books on topics studied in social studies or science classes), and get opportunities to write about some of the things they are reading about. They realize that what is learned is more likely to be remembered and used in the future if it serves students' purposes beyond meeting school requirements.

Finally, effective teachers are thoughtful about their practice: They take time for reflection and self-evaluation, monitor their instruction to make sure that worthwhile content is being taught to all students, and accept responsibility for guiding student learning and behavior.

How Much Can We Expect From Teachers?

What is already known about effective teaching provides useful guidance to teacher-education and school-improvement efforts, and this existing knowledge base will continue to be elaborated through future research. This suggests considerable optimism about the prospects for improving the quality of teaching in the schools, especially if one assumes, as we do, that research on teaching is in its infancy and the existing knowledge base is but a tiny fraction of what it eventually will become.

However, the same research that has documented the principles described above as elements of effective instruction has made it clear that few teachers follow all of these practices all of the time. Yet, most teachers believe that they are doing an effective job. Certainly there are many outstanding teachers and many others who routinely do some things particularly well. However, the generally high level of satisfaction among

teachers concerning their own personal effectiveness as instructors suggests that, as a group, teachers may not see much need for making the substantial investments that would be required to change their teaching practices in the directions outlined above.

Teachers are usually receptive to suggestions for change if advocated changes make sense to them. Typically, interventions designed to change teachers' practices in particular ways are successful with most teachers, at least in the short run (e.g., Stallings & Krasavage, 1986). However, after teachers have acquired the knowledge and skills needed to change their practices in the prescribed ways, and in many cases even after they have seen positive results with their students, all too often they revert back to their previous practices (Porter, 1986b).

There are many possible reasons why interventions seldom appear to achieve stable, permanent changes in teaching practices. One is that the advocated changes are not really improvements or do not bring about benefits sufficient to justify the efforts involved in implementing them. But why do many teachers drift away from innovations that appear to be worthwhile and cost effective? For some teachers, part of the explanation may be that they teach in isolation, free from surveillance and possible critical commentary by peers and other adults. Another part of the explanation is that teachers must cope with a full agenda that typically precludes time for serious reflection, so that it is easy for them to drift into and out of habits and routines without being very aware that it is happening (drifting away from recently acquired skills and reverting to earlier habits is especially likely to occur through this mechanism). Another factor is orientation toward a trial and error, "see what works for you" view of professional decision

making that is often promoted by teacher educators, an orientation that causes many teachers to overemphasize personal preference and underemphasize concern about student outcomes when making decisions about instructional practices (Buchmann, 1986).

Another part of the explanation is that, as research identifies more and more elements of effective teaching practice, there will be further increases in recommendations about additional things for teachers to do and few if any recommendations for what should be given up. The picture of good teaching that emerges from research features hard work, hard thinking, tough choices, and objective evaluations. The energy required to teach this way probably is underestimated by research that considers only one segment of a teacher's professional life at a time. Research tends to look at teaching in small segments, typically concentrating only on particular lessons taught within one subject matter area. More attention needs to be focused on larger units of instuction and on what is required to teach effectively all day, every day, year after year. Similarly, more needs to be learned about the costs that teachers experience in adopting new approaches to teaching and about how these costs might be ameliorated.

Conclusion

Research on teaching reveals that overly ambitious models depicting teachers as fully rational curriculum designers, developers, and implementers are inappropriate but so are models that depict teachers either as non-thinking technicians or as artists that operate mostly on the basis of unarticulated intuition. As contemporary research on teaching continues to fill in the developing picture of effective professional practice, and especially if improvements in teacher education result in better preparation

of teachers to engage in such practice, we can realistically begin to expect everyday instruction to conform to rational (or at least "boundedly rational") models such as the one shown in Figure 1. Such models would depict teachers as selecting and delivering curricula (recognizing that the content will have to be interpreted using appropriate examples and otherwise adapted to local student needs) and as making decisions based on relevant content and pedagogical knowledge with particular objectives in mind (rather than on some less optimal basis).

Although these anticipated developments will make everyday teaching more systematic and predictably effective, there is no need to fear that they will make teaching mechanistic, remove the artistic or craft elements from it, or result in the deskilling of teachers. On the contrary, the development of a knowledge base to inform teacher education and teaching practice will complexify rather than simplify the teaching profession, just as the development of a medical knowledge base has complexified medical practice. In fact, as the relevant knowledge base develops, the major challenges facing education as a profession will revolve around developing preservice and inservice professional education programs that are effective in enabling practitioners to learn about and keep abreast of developments in the field, as well as developing methods of organizing schools and teacher roles that will enable teachers to make good use of available information in order to optimize student outcomes while at the same time finding their work doable and rewarding.

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